

# 6.0 Pedagogy

## 6.1 Philosophy

**Pedagogy:** Activities that impart knowledge (also, the art of teaching).

In September of 1999, Blaine Benedict, a member of the Las Vegas Community, proposed that a residential based science school be created, stating "... *This school would serve as a center of study emphasizing the unique environment of Nevada's Great Basin and the Mohave Desert Regions.*" Subsequently, in October of the same year, he described a programmatic vision that embodied the philosophical (as well as pragmatic) basis for the Oliver Ranch Science School: "*A residential field school would be constructed to carry out an on-site academic and field studies program. The curriculum would stress a "hands-on" learning approach to environmental studies. Challenging and unique educational activities would occur outside the traditional classroom confines. Qualified professionals with specific expertise in the desert eco system would provide instruction. Original research projects would be encouraged as well as long term environmental monitoring.....*"

He went on to write, "*The school site and building would encourage an awareness of the surroundings by using a combination of aesthetic and functional design...*"

During programming discussions many participants expressed their vision for the Oliver Ranch School. Perhaps Angie Lara says it best, "*this place is for the kids, to raise their awareness, to inspire and to let them know that they do make a difference.....it should make them aware of, allow them to experience and to create a spiritual connection to this land.*"

She continued, "*students (both children and their teachers) should feel wonderment when discovering the layering of geology, living things and the heavens. We need to create an experience the students will never forget. The values learned must be exported to the rest of the community. Here, children can get a sense of connection to the land; a re-grounding the need for which became particularly apparent in the increase in visitation following 9/11. While this should be a soulful place, it also will be technologically modern; the buildings themselves should be educational tools*"

Tim O' Brien, the manager of the Red Rock Canyon National Conservation Area, because of his own experiences with natural history, expresses that "*the school can open children's eyes to a potential life style change....this is a learn by doing place where students find they are capable of doing more than they had imagined.*"

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The noted naturalist, Gary Paul Nabhan, explains, in his book, The Geography of Childhood, “ *None of us can predict or control the career or avocation choices of our children. All we can do is introduce, try to prevent prejudice, battle gender stereotypes, teach by the example of our own attention and wonder. All we can do is recite from the scripture of maps and field guides. Give names to the mountains and rivers, give names to the trees. Give voice to the emotions that storms and tundra flowers, young bison and soaring ravens, can pull from us*”.

Nabhan, later goes on to say, in reference to the TV based, sound bite, world we live in, “.....*we need to return to learning about the land by being on the land or better by being in the thick of it. That is the best way we can stay in touch with the fate of its creatures, its indigenous cultures, its earthbound wisdom. That is the best way we can stay in touch with ourselves.*”

### Conclusion:

Learning about the land on the land, a simple concept, guides our actions. Different people learn in different ways. To some, the mountain is a book to be read; strata are the words, to others, its shape evokes a giant tortoise or a sculpture. Many see that high land mass as a place to go for great views or relief from the heat. Scientific, poetic, pragmatic, all, reasons to treasure the mountain; a place that can only remain pristine as long as we understand its importance.

Fifth grade, “that time when children are actively seeking knowledge and wanting to know the how and why of things” provides our primary audience. They are the group that will be taught the value of our special place and in turn enthusiastically influence their parents and friends.

Educating in the environment (not environmental education), providing a plethora of hands on, personally active experiences, is fundamental to creating the sense ownership that causes individuals to take personal responsibility for preservation of our place.

As Mark Morse, Manager of the Bureau of Land Management in Southern Nevada, says, “*we need to give something back to the community .....we must touch the kids*”.

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## 6.2 Goals and objectives

The goals and objectives of the school at Oliver Ranch clearly reflect those of the BLM. The “BLM Environmental Education National Strategy,” published in 1995 mandates linking environmental education initiatives to schools under the umbrella “School Partners Program.”

The vision, as described in this strategy, is that “public participation in BLM Environmental Education Programs will lead to healthier and more productive ecosystems and to better educated citizens willing to assist the BLM in solving and preventing complex environmental problems on public lands.”

The theme of this strategy is “Sustaining Healthy Ecosystems,” which seeks to “expand public knowledge and understanding of the following:

- The characteristics of ecosystems
- The local and global patterns of ecosystems
- The biodiversity and productivity of ecosystems
- The physical processes that produce changes in ecosystems
- How human activities influence ecosystems
- How people can apply ecosystem concepts to understand and solve environmental issues

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In February of 2004 the Core group was asked to explain **why they were involved in the creation of the Oliver Ranch Science School**. The answers, in many respects, are a good way to identify pedagogical goals and objectives.

**Goal: Create a sense of personal responsibility for the environment.**

Educating young people in particular about our environment and our relationship with it, is the most powerful way we can preserve it ... to build a stronger environmental and conservation ethic in Las Vegas ... development of the RRCNCA must keep with the mission of environmental education ... to protect the environment from ignorant impacts and better our future WHB program ... to be part of a very important program that will educate youth about native plants, horses and the many things that most children will never see, hear about or touch

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### **Goal: Provide a place for research and teaching related to science**

To create a venue that can help children do science and learn about their environment ... to keep the process as pure as possible with respect to the educational aspects of the school ... to involve the university in curriculum development and educating the educators ... to create an educational research facility as well as providing an educational location

At the April, 2004, programming workshop held on site at Oliver Ranch participants were asked to make a written response to a three part question relating to the purpose of the new school. **“What is the role of the Oliver Ranch School within the community at large? The neighborhood? and the NCA?”** Answers follow:

#### Role within the community at large:

### **Goal: Within the community at large, emphasize science education as a way to create an awareness of the value of the Mojave Desert**

ORS should be one place of many in our community for developing science literacy ... providing a venue for accomplishing the stated ORS mission ... use learning in the environment to educate/instill stewardship and respect for the Mojave Desert ... create a sense of community by building a sense of pride, belonging, and voice

### **Goal: Through common commitment to preservation of the Mojave, foster a sense of community**

Build a sense of community and belonging in the Mojave Desert and an understanding of the environmental issues that are vital in sustaining the American Southwest ... teach students to be better stewards of the land and give them the ability to pass that knowledge to others in the community ... change of behavior/perception to encourage people to preserve the environment, and to care for all natural resources as precious ... Interconnectedness of plant, animal, environment ... create an environmental education based on living in a desert community and sustainability of resources ... student/parents can gain information & experience what our environment has to offer for use in our everyday life

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**Goal: Through the process of educating 5<sup>th</sup> graders, demonstrate to the community at large that there is a responsible way to build in the Las Vegas valley.**

Demonstrate to the community at large how environmentally safe and sound systems and techniques can be used at Oliver Ranch and in the community to conserve resources and use them more effectively ... source of pride, support, and learning excellence ... to inspire, a model, an ideal ... to reinforce and strengthen science curriculum and instill an attitude about science that will foster on going interest and understanding about the natural world ... to serve as a place for longer term (multiple day) immersion experiences in learning about the Mojave desert ... modify behavior of 3-8,000 5<sup>th</sup> graders a year ... show how the environment affects peoples daily life ... educational opportunities for 5<sup>th</sup> graders to learn about eco-system at the Ranch and help develop their 'sense of place' as well as stewardship to involve/engage in advocacy of conservation of environment in the community and classroom

**Goal: In view of the transient nature of the Las Vegas population, create a better understanding of why they should value this special place.**

To be a valuable addition to the local and regional science/environmental educational opportunities, and to work concurrent with and supplemental to classroom curriculum for 5<sup>th</sup> graders ... to become a respected center of learning and promoter of preserving the environment and enjoying it wisely ... to inform and instruct a variety of resident and visitors about responsible use of non- renewable resources and responsible living in their environment ... to teach the rest of the world we are something besides 'Sin City' ... to encourage participation in outdoor recreational/environmental activities ... volunteers ... educate forward ... contribute, through children, to understanding for need to preserve and protect ... keeping the environment healthy for their children/grandchildren ... create a 'sense of place' through understanding and appreciation

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### Role within the NCA:

#### **Goal: Create a foundation of understanding that will lead to Support of the BLM's mission within the NCA**

Venue for helping to carry out BLM's mission statement ... explain what an NCA is, why we have them, the differences from National Parks, Wilderness Areas, Wildlife Refuges, etc. ... to find a niche that will compliment the NCA and provide awareness of all programs within the NCA ... trusted partner to the NCA that furthers NCA mission ... a place for learning and research to aid in preserving the NCA environment ... to complement the learning that visitors receive at the Visitor Center. ... education about the Mojave desert consistent with NCA goals ... to promote a feeling of stewardship for an area in danger of being loved to death ... a place where conservation is practiced as well as taught ... to be the focal point for new ideas to preserve and promote use of the NCA and encourage others to get involved in those efforts as careers or volunteers

### Role within the neighborhood:

#### **Goal: Connect the neighborhood to the NCA through a better understanding of the environment**

Giving students a sense of responsibility regarding their own neighborhoods – taking their environmental education home with them ... stimulates neighborhood dialogue and commitment to the environment ... instill sense of stewardship for unique resources preserving in our youth (& other groups) the value of our local environment in southern Nevada and how to instill community responsibility for protecting this very important natural resource ... to have a strong partnership with the adjacent Blue Diamond Community ... preserving the values of the 'neighborhood' – both the built environment and natural environment ... a point of pride for the neighborhood ... interface well and bring a positive influence to others in the neighborhood ... understand what specifically is going on around them within their 'backyard' ... pride in association with a successful learning institution ... education about the Mojave desert ... to create an awareness of stewardship ... compliment existing facilities and augment facilities with missing components

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### 6.3 Curriculum possibilities

The Curriculum Subcommittee (CS) of the CORE group, under the guidance of chair, Dr Paul Buck of the Desert Research Institute, has been meeting on a regular basis in order to establish curriculum directions. Since the school will primarily serve 5<sup>th</sup> graders from the Clark County School District it must mesh with the CCSD curriculum goals.

The Subcommittee includes several members from the Clark County School District, an outdoor environmental education specialist, a cooperative education specialist from the University of Nevada at Reno, and representation from the Outside Las Vegas Foundation the Desert Research Institute, the Community College of Southern Nevada, and Clark County.

Certain physical facilities have been identified as necessary to support the curriculum. These include an artificial wetland, walk through lysimeters, other constructions such as shade shelters, and adequate open space for unstructured play. The specifics of these will be further explored when it is determined if round five SNPLMA is available.

During a site visit to Oliver Ranch, on January 7, 2004, the Subcommittee identified several sites on the property that lent themselves to environmental teaching opportunities that matched the curriculum development plans as follows:

- a. Construct/develop an artificial wetland for teaching and learning near the Oliver Ranch Springs. The natural drainage present at the spring should be maintained and protected as it passes through the campus down to the western border of the property. As part of this the swimming pool could be adaptively re-used as living machine/artificial wetland area.
- b. The hill immediately behind the current Oliver Ranch building (where the old cistern is located) should be used for the topographic mapping teaching area. It has been suggested that this could be developed through a system of paved trails at known elevations up the hill with fixed markers of known elevation placed on a grid system.
- c. A trail should be constructed between the school at Oliver Ranch main campus area and the Mormon Green Springs with a teaching venue established in a suitable place along the trail. A number of true riparian species exist here, and there is potential for a linear boardwalk with a teaching shelter to be associated with the wetland habitats in this area.

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d. A trail should be constructed along the channel/riparian area leading north towards the future wild horse and burro facility. This is a promising area for nighttime animal observation.

### Integration with the Full Option Science System (FOSS)

5<sup>th</sup> grade classrooms in the Clark County School District use the FOSS modules. Consideration has been given as to how these classroom investigations could be extended into the outdoors at an environmental school and the types of facilities that might be needed to support them.

The Subcommittee has identified general “menu” items that are broader focuses into which the FOSS investigations can be placed. 5<sup>th</sup> grade teachers will be asked to select one or more menu items to be explored at the school at Oliver Ranch. Each menu item will have a specific content focus, but all will have some process skills in common. These commonalities will include critical thinking, active inquiry (research), mathematical applications, mapping, keeping a journal, close extended observation of nature, as well as others.

At one meeting, for example, the CS specifically looked at the module “Environments” which consists of six classroom investigations into:

- Terrestrial Environments
- Bugs and Beetles
- Water Tolerance
- Aquatic Environments
- Brine Shrimp Hatching
- Salt of the Earth

The investigations conducted in the classroom through use of aquariums and terrariums, for example, could be extended into the field by use of monitoring or study plots. These plots would be situated on a variety of landforms, under differing soil moisture conditions and near human/exotic plant and animal species. These would be contrasted with control plots to form the basis of a longitudinal study at the school. Study plots would have plant and animal species identified and counted, although not generally collected.

At another meeting the CS looked at the module “Landforms,” and linked several school activities at Oliver Ranch to the work done in the classroom. The activity ideas included a “walk around” to identify various landforms, a topographical mapping experience, photography from certain vantage points to document long term change, creation of a 3-dimensional relief model of the area, and a very large stream table where students could study erosion, deposition, etc.

SW from Paul Buck’s meeting Minutes

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### **Suggested curriculum related activities**

During the Goals and Objectives Session of the programming workshop held at Oliver Ranch in April, 2004, participants were asked to answer the question **What kinds of activities can you envision occurring at the school?** An extensive list of was generated. After compilation, (See Appendix A.) participants were asked (by e-mail) to prioritize their top 10 choices in order of importance.

Ten responses were returned, and while there were only three activities that received near unanimous support, the following is a list in descending order of those receiving three or more votes:

1. Study of ecosystem interrelationships: plants, animals, geology, water
2. Communication value of stewardship to others
3. Use of scientific method (many possibilities identified)
4. Riparian studies including nature of springs
5. Understanding geologic landscape of RRC and Mojave Desert
6. Measuring human impact on environment
7. Mapping, exploring, hiking
8. "Night in the desert" with both biology and astronomy components
9. Integration of curriculum components
10. Data collection on "green design elements" with analysis
11. Studying the effects of rain, drought, wind, etc. on environment
12. Identification of native species, adaptation, transect observation
13. Continuum of projects before stay, during, after
14. Fun

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### 6.4 Facilities as a teaching tool

Architecture must always respond to and integrate into the environment. For the school at Oliver Ranch, it has an even more important goal, to teach children that living in the desert comfortably does not have to include destruction of the land or the waste of resources. The built environment can teach lessons of conservation, sustainability, responsibility and stewardship.

The facilities for housing an environmental education program should strive to teach by example. The architecture should seek to embody the curriculum of conservation in the design of the structures themselves.

This is an opportunity to look at buildings in an atypical way - the architecture for such a facility should not imply or assume a separation from the natural environment. It should blend with it – seamlessly, harmoniously, and with great enthusiasm.

The use of recycled materials, passive heating and cooling, wastewater reclamation, energy conservation and production make the structures teachers. Shading and landscape design, use of outdoor rooms, bringing the outdoors in, natural lighting, use of color, vegetation, water, layout, lighting and noise can achieve a balance and harmony with nature that delights and inspires.

Creating this facility also creates opportunity to teach important relationships between ecology economics and architecture. It can demonstrate difficult to understand issues like life cycle costs, and what is the actual total energy embodied in a material; including the resources consumed in its production, the concurrent pollution created in the processes and what the projected cost of cleanup could be. (Orr, 1994)

The structures should encourage mindfulness in those who use it. Functions of buildings can demonstrate cause and effect such as eco-friendly construction. Actions such as storm water reclamation, passive cooling and solar energy use can be articulated as they work to make the center function; demonstrating the actual principals of fully sustainable design at work for everyone to see.

This is an opportunity to teach the beauty and cost effectiveness of environmental architecture to students who can learn those principles and propagate them in their own building choices later in life.

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During a discussion of this issue at the programming workshop held at Oliver Ranch in April 2002, participants provided the following ideas when asked **How could a building teach its occupants a lesson?** The responses have been grouped according to the possible teaching opportunities.

### How a building can fit into and be a part of the environment around it

Compare and contrast explanation of human habitation impact vs. that of other living creatures (i.e. why humans make such an impact on the land) ... adaptation (mirror animal, plant, historic adaptations to lack of water, high heat) ... connectivity (show cause/effect of choices, mirror natural elements) ... buildings can be designed to not only be integrated into the environment, but to make the occupants feel integrated into nature – ‘sensitizing’ them to the environment, helping to inspire stewardship ... use the walls of shade structures as a metaphor for the strata of the surrounding hills to serve as a teaching aid

### Use of technology/appropriate planning to conserve resources

Conservation of energy (by using the sun or shade to heat or cool) ... how technology both helps and hinders sustainability ... by exposing systems and environmentally sound design practices in a simple and clear manner (low-tech) orientation of buildings to encompass passive heating and cooling ... efficiency of design & adaptability of use: passive solar ... by having exposed utility lines, ductwork, mechanical systems, wires, etc. the occupant can learn ... the building (facilities and design) could teach kids about energy efficiency, water saving, effective insulation methods from heat and cold: solar energy panel for warm water, toilet and shower that use the minimum of water, wall insulation and shades, water tank that indicates the amount of water used ... building orientation, design & use of natural elements (plantings, etc.) to reduce dependency on power consumption: trees shade in summer but allow natural heating in winter, thicker walls maintain a more consistent inside temperature, transitional (shade) areas provide buffer zones ... what happens to the air, water, and energy entering and exiting the structure ... temperature modifications in environment – what materials are in a building that can modify temperatures, what changes or uses of a building can alter temperature (i.e. solar energy, moving walls, alternative energy forms)

### Recycling and waste control

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By taking resources that are not captured or are discarded & using them to displace the use of commonly used non-renewable resources (i.e. composting, raw-water recapture & reuse, waste incineration (clean) for energy, use of discarded rubber or aggregates for trail foundations, etc.) ... recycling (reusing material here and use recycled building material) ... recycled materials can be beautiful (e.g. the use of glass/plastics at Islandwood) ... there are many ways to save energy and one person can make a difference (measurable waste) ... actual transparent waste/recycle containers to view relative amounts

### How a building connects us with nature

The advantages of simplicity ... how a room or view can inspire or tire a person ... different shade structures reflect different homes: wickiup, nest, burrow, rocky area, tree... usable examples of energy efficiency using existing nature ... displays of flora and fauna ... explain unusual features ... there is the building itself in the physical form and then there is the interrelationship between the building and the landscape that molds the living environment. The building and landscape together can teach how to create the micro-environments that form pleasant/comfortable interior and exterior living spaces. how these micro-environments have been established by human inhabitants over time and how they may continue to evolve into the future here at this school and how this school together with its students will contribute to the evolution of this technology ... visually comment on man's connectivity with the land ... teach kids to take care of themselves in the environment

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### 6.5 Interpretive opportunities

During the meetings at Oliver Ranch, significant discussion and feedback indicated a desire to explore a number of opportunities for interpretive elements at the school. The expressed vision and purpose of the school relates to interpretation in a number of ways. On the majority of the site, the desert should speak for itself, and interpretation should be through hands-on instruction. In keeping with the idea of minimal structural and visual impact on the site, interpretation will be integrated with other structures including the school buildings, greenhouse, observatory, and shade/learning structures. Interpretive elements might also be structured to serve as teaching tools for instructor use during the learning experiences.

Examples of interpretive/themed elements of shade structures

- geologic cross section
- plant type outlines
- birding (migratory map)
- water table
- compass elements such as GPS and mapping sightline points showing map and coordinates
- structures could represent different animal homes; a burrow, a nest, an ant colony

A significant opportunity exists for interpretation of the architecture and operations of school buildings themselves, as they will be examples of sustainability and desert adaptation. Construction methods, materials, shading, water and energy systems can all be interpreted in ways that tie directly to the student experiences in the desert and will serve to reinforce environmental science curricula.

The idea of quantifying and tracking of resource usage and environmental impact at Oliver Ranch was brought up by a number of stakeholders. Students might take part and even compete with each other in the collection of pertinent data. Current PDA technology might be employed that allows students

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to record data and communicate with each other and their instructors. PDAs could also be used as information repositories for science curricula, negating the need to produce paper resources. This digital processing and storage of information also facilitates pre- and post-visit curricular activities. It is also desirable to have the ability to access individual and cumulative data sets both at Oliver Ranch and remotely for use in the classroom and by other entities with interest in the results generated.

Some of the data to be tracked could include:

- Individual and group energy consumption
- Individual and group water usage
- Recycled material volumes
- Inventories/surveys of plant and animal species
- Water table fluctuations
- Meteorological observations

A designated space for astronomical observations and night studies by students will also create additional interpretive opportunities, including Native American astronomy/cosmology, and desert night sounds interpretation.

Additional sustainability examples with exhibit potential include the following.

- Transparent waste and recycling containers “Recyclables can be beautiful”
- Visible examples of energy efficiency
- Interpret the thermal mass of the walls and insulation
- Interpret the shading of the building
- Interpret the use of recycled materials in the structures, i.e. imploded casino materials
- Exposing operating systems, utilities, ductwork, etc.
- Compare human habitation impact versus native animals impact

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- Real-time energy and water measurements and continuum of data collection
- Pump to fill your own water tanks for showers
- Use a simple numbering system through the site to illustrate energy usage; an LED flashlight would be a 2 while a regular flashlight may be a 25

Additional interpretation could include the following.

- The cultural history of the site – timeline
- Cafeteria use of indigenous plants in school diet – edible plant graphics
- Interpretive program during transport

The following spaces might feature interpretive elements; entry, gift shop, gear room, laundry, restrooms, showers, dining, recycling/trash, loading/trash, flex labs (indoor and outdoor), greenhouse, weather station, traveling exhibit space, outdoor classroom gathering areas.

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